

1. Preliminary Notice of the Isopoda collected during the Voyage of H.M.S. 'Challenger'.—Part I. *Serolis*. By FRANK E. BEDDARD, M.A., F.R.S.E., F.Z.S., Prosector to the Society¹.

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The specimens of *Serolis* dredged during the voyage of the 'Challenger' are referable to sixteen species, of which seven have been more or less fully described by previous writers. Six of these species are as follows:—*Serolis cornuta*, Studer; *Serolis lutifrons*, White; *Serolis septemcarinata*, Miers (= *Serolis ovalis*, Studer); *Serolis paradoxa*, Fabr. sp. (= *Serolis Orbigniana*, M.-E.); *Serolis schythei*, Ltk.; *Serolis tuberculata*, Grube. There is besides a single specimen which is closely similar to the type specimens of *Serolis convexa*, Cunningham, preserved in the British Museum, but shows certain slight differences in which it more closely resembles *Serolis plana*, Dana; I am inclined to think that these two species are identical. The chief character which Grube uses to differentiate *Serolis convexa* from *Serolis plana*, and also *Serolis gaudichaudii*, is the presence in the former of a tuft of hairs upon the fourth joint of the second thoracic appendages. Having examined both *Serolis convexa* and *Serolis gaudichaudii*, I am able to state that it is the males only and of both these species which are thus characterized². *Serolis gaudichaudii* is, however, quite a distinct species, and cannot be confounded with *Serolis convexa*. Besides these seven species six other species of the genus *Serolis* are known, viz.:—*S. serrei*, Lucas; *S. gaudichaudii*, M.-E.; *S. carinata*, Lockington; *S. plana*, Dana; *S. trilobitoides*, Eights; and *S. acutangula*, Grube. Of these *Serolis acutangula* is probably identical with some other form, since Grube, who originally described it, omits all mention of it in his subsequently published monograph of the genus; *Serolis plana* appears to me to present no clearly defined differences by which it can be with certainty separated from *Serolis convexa*; the figure given by Eights of *Serolis trilobitoides* is so poor, and his description, which does not in all respects tally with the figure, so incomplete that it is not easy to distinguish this species from *Serolis cornuta*, St. Further details are required concerning *Serolis serrei* and *Serolis carinata*.

The total number of species of *Serolis* at present known with certainty is therefore eight.

The nine new species in the 'Challenger' collection I propose to name as follows:—

<i>Serolis bromleyana</i> (Suhm).		<i>Serolis elongata</i> .
<i>Serolis neæra</i> .		<i>Serolis pallida</i> .
<i>Serolis gracilis</i> .		<i>Serolis longicaudata</i> .
<i>Serolis antarctica</i> .		<i>Serolis minuta</i> .
<i>Serolis australiensis</i> .		

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² Since the above was written I find that Studer (Abhandl. d. Kön. Preuss. Akad. Wiss. Berlin, 1883) has come to a similar conclusion.

The first five are all inhabitants of deep water; the remaining species were dredged in shallow water off the coasts of Southern and Eastern Australia.

1. *SEROLIS BROMLEYANA* (Suhm).

This species has already been briefly characterized by the late Dr. v. Willemoes Suhm from two specimens obtained near the Antarctic ice-barrier. These two specimens are the largest contained in the 'Challenger' collection; the male measures 54 millim. in length and 56 millim. in greatest breadth; the length from the anterior end of the rostrum to the termination of the 6th epimeron is 78 millim. The female is somewhat smaller than the male, and measures 45 millim. in length, 39 millim. in breadth, and 62 millim. from the rostrum to the end of the 6th epimeron. This species is one of the largest of the Isopoda. Like many of the other deep-sea species it has extremely long spine-like epimera, which are longer and project further outwards from the body in the males than in the females.

The cephalic shield stands out in relief from the surface of the first thoracic segment, from which it is separated by a suture lying in a deep depression; its anterior margin is prolonged into a short rostrum; the lateral portions of the cephalic shield extend for some way anterior to the rostrum, and are cut off from the rest by a ridge which passes almost in a straight line from the rostrum to the sides of the cephalic shield; the surface is raised into three rounded prominences, two on the inner side of the eyes and a median T-shaped prominence between them. The eyes are inconspicuous, owing to their pale greyish colour and absence of corneal facets. The epimera of the first thoracic segment are divided into three portions by a Y-shaped ridge; the other epimera gradually increase in length up to the sixth, which is the longest; both the epimera of the abdominal segments are extremely long and reach beyond the limit of the caudal shield in the male; in the female the last epimera barely reach the end of the caudal shield.

The caudal shield is oval in form and longitudinally carinate, the posterior end is slightly excavated; at about the middle of the caudal shield near the lateral margin is a notch on either side; the terminal appendages of the body are attached about halfway down the caudal shield. The colour (in spirit) is a dark slate-blue.

Station 156, 1975 fathoms; Station 164A, 410 fathoms; Station 168, 1100 fathoms; Station 169, 700 fathoms.

2. *SEROLIS NEÆRA*, n. sp.

This species almost rivals *Serolis bromleyana* in size; the largest male specimen measures 43 millim. in length and 47 millim. in greatest breadth, the length of the sixth (longest) epimeron being 38 millim.; the female is smaller than the male, the largest specimen measuring 40 millim. in length, 40 millim. in greatest breadth, the sixth epimeron measures 31 millim.

The males of *Serolis neæra* differ from the females therefore by their greater size, and also by the greater length of the epimera,

which project from the body almost at right angles with its long axis, while in the females their direction approximates more nearly to that of the sixth pair of epimera, which pass backwards almost parallel to the long axis of the body. In this respect *Serolis necera* resembles *Serolis bromleyana*.

The cephalic shield has its anterior margin produced into a short rostrum, and at some little distance from the anterior edge there is a ridge passing across from side to side exactly as in *Serolis bromleyana*; the lateral parts of the cephalic shield are not, however, so markedly prolonged as in the latter species; in other respects the cephalic shield differs greatly from *Serolis bromleyana*. The eyes are large and uniform, and distinctly faceted; between their anterior extremities are two pairs of flattened spine-like projections directed backwards, the outer one on each side being broader and slightly bifid at the tip. The hinder margin of the cephalic shield is indented, and forms three projections, the two outer ones being somewhat triangular in shape and tuberculated on the free margin, and the inner median one transversely elongate and much like the labium in shape, with a slightly convex outer margin. The epimera are long and spine-like, as in *Serolis bromleyana*. The epimera of the first thoracic segment are divided into two by a ridge which passes outwards and slightly upwards; the other epimera gradually increase in length up to the sixth, which is by far the longest; the epimera of the second abdominal segment extend considerably beyond the termination of the caudal shield; while those of the third segment only reach as far as the commencement of the lateral margin of the caudal shield; the outer margin of the former is slightly denticulate.

The thoracic segments are furnished with a backwardly directed median spine, which is largest upon the first three segments and almost disappears on the first two abdominal segments.

The caudal shield is very closely similar to that of *Serolis schythei*; at the upper end is a flat triangular spine, and between this and the posterior margin of the shield another smaller spine; on either side of the latter, and connected with it by a ridge, are two small spines, above which and rather to the outside is another short spine on each side continuous with a long ridge passing upwards and inwards, until it nearly reaches the lateral termination of the large anterior spine.

The second pair of antennæ are a trifle longer than the first pair. Station 320, 600 fathoms; Station 318, 2040 fathoms.

3. *SEROLIS GRACILIS*, n. sp.

Three examples of this species were dredged off Pernambuco, from a depth of 675 fathoms; they are all males.

The largest specimen measures 11 millim. in length by 12 millim. in breadth.

The cephalic shield is almost exactly like that of *Serolis bromleyana*, but the antero-lateral portions do not project so far forward; the eyes are small and inconspicuous, whitish in colour.

The epimera are well developed, but are more sickle-shaped and

flattened and not so spine-like as in the last two species; the sixth pair, as usual, are the longest, and project backwards beyond the caudal shield for a space of about its own length; the other epimera increase in size from before backwards; the anterior and posterior processes by which each epimeron "articulates" with the neighbouring ones are further away from the proximal end of the epimeron, which gives the epimera the appearance of being shorter than they really are; the fifth and sixth epimera (as well as the three in front) are separated from the tergal portion of the segments by a distinct suture. The epimeron of the first segment shows traces of its original composition out of two epimera by the presence of a transverse ridge, and another ridge, continuous with that upon the cephalic shield, crosses its anterior half, bending backwards at the margin to join the distal extremity of the first transverse ridge; the epimeron of the second free abdominal segment projects for a short distance beyond the caudal shield; the epimeron of the third abdominal segment extends about halfway down the caudal shield.

The caudal shield is divided into two portions by a sinuate transverse ridge; it is slightly keeled, and near the anterior margin is a short flat spine in the middle line, on either side of which is an obliquely placed ridge running towards the lateral margin of the caudal shield.

The two pairs of antennæ are about equal in length.

Station 120, 675 fathoms; off Pernambuco.

4. *SEROLIS ANTARCTICA*, n. sp.

The three species just described agree with each other, and differ markedly from all the shallow-water species of *Serolis* by the enormous development of the epimera; the present species, although an inhabitant of the deep sea, has the general appearance of one of the shallow-water forms. The general form of the body is a broad oval; the epimera are comparatively short, and do not project backwards as long spiniform processes. This species is at once recognizable by the strongly marked sculpturing on the upper surface of the carapace, which is different from that of any other *Serolis*, and by the entire absence of eyes. In the place of the latter are two minute tubercles about 1 millim. in extent, which show no traces whatever of a faceted cornea, and no nervous structures could be detected beneath the tubercle, the cavity of which is occupied simply by a plug of connective tissue. The sculpturing on the dorsal surface, which is more marked upon the epimera, consists of a number of ridges arranged in a reticulate fashion. The form of the body differs in the two sexes: in the male the outline of the body is more circular than in the female; the breadth of the body in the former is proportionately greater than the length, owing chiefly to the greater length of the epimera. As in all other species of *Serolis* the sixth epimera are the longest, and extend just beyond the end of the caudal shield in the male; in the female the terminations of the sixth pair of epimera are just on a level with the end of the caudal shield. The ventral portion of the three free abdominal segments, which

usually differ in the two sexes, are the same in this species. The males also are larger than the females, the largest male specimen in the 'Challenger' collection measuring 34 millim. in length and 31 millim. in breadth, while the length of the largest female specimen is only 32 millim. in length by 26 millim. in breadth.

In both sexes the body is roof-shaped, sloping gradually downwards on either side from the median line, which is distinctly keeled; the posterior margin of each segment has a short tubercle in the median line. The cephalic shield has the same texture as the rest of the body, and hardly projects above the level of the first thoracic segment. The latter is not divided into two portions by a transverse suture; it is prolonged anteriorly into a short rostrum, and a ridge, which extends on either side from the rostrum to the lateral margins of the shield, divides off the antero-lateral portions as in *Serolis bromleyana*. The second, third and fourth epimera are separated by a distinct suture from the rest of the segment.

The caudal shield is irregularly pentagonal in outline; the posterior extremity is slightly turned up; there is a distinct median carina, which divides into two at the upper end; on either side of this is another Y-shaped ridge, inclined at a slight angle to the longitudinal axis.

The second pair of antennæ are distinctly longer than the anterior pair.

This species was dredged at the following stations:—Station 122, 400 fathoms; Station 146, 1375 fathoms; and Station 147, 1600 fathoms.

The remaining five species form a well-marked group, confined to the shores of Southern and Western Australia. They are to be distinguished by the characters of the fifth and sixth thoracic segments from all the other species of *Serolis*; the dorsal portion of the fifth segment is extremely narrow, while the dorsal portion of the sixth segment is either altogether absent or fused with the succeeding first abdominal segment; with one exception—*Serolis minuta*, which is a transitional form—the epimera of the abdominal segments are undeveloped and the caudal shield terminates in a slightly bifid tip; the first thoracic segment is not divided by a suture; the females also appear to be larger than the males; the last-mentioned characters however, although common to all the members of this particular group, are also to be found in other species. All these Australian species are small, the largest not measuring more than 20 millim. in length. One species belonging to this group is already known, viz., *Serolis tuberculata*, Grube.

5. SEROLIS AUSTRALIENSIS, n. sp.

Of this species the 'Challenger' obtained three examples, two males and one female; both the males are the same size, measuring 11 millim. in length by 8 millim. in breadth; the female is rather larger, measuring 13 millim. in length and 11 millim. in breadth. In other

respects the two sexes do not differ, except of course in the form of the second thoracic and second abdominal appendages.

The form of the body is regularly oval, and the epimera overlap each other closely and do not project freely except the sixth pair, which project some way beyond the two last pairs.

The dorsal surface of the body is entirely covered with small rounded tubercles, and the posterior margin of each segment is occupied by a series of rather larger tubercles; in the middle of the posterior margin of each segment, including the cephalic shield, is a short backwardly directed spine. As in *S. longicaudata*, the sutures separating the fifth thoracic from the sixth and the sixth from the first abdominal are incomplete in the middle line.

The caudal shield is irregularly triangular in outline, it has a slight carina. About the middle a row of rather larger tubercles crosses the carina at right angles; one of these tubercles on each side, close to the lateral margin of the caudal shield, is conspicuously large.

The middle portion of the scuta of the three free abdominal segments is prolonged into a spine, that of the first abdominal segment being by far the larger.

Both pairs of antennæ are of about the same length.

Station 162, 38 fathoms.

6. *SEROLIS ELONGATA*, n. sp.

This species in its general configuration is not unlike *Serolis australiensis*, and it is very possible that the examination of a large series of specimens would prove that the two are identical. In the meantime, however, the single specimen contained in the 'Challenger' collection is sufficiently different to warrant its separation as a distinct species.

The specimen, which has the characters of a female, measures 10 millim. in length by 6 millim. in breadth. The surface of the body is not so much covered with tubercles as in *Serolis australiensis*; the posterior margin of the cephalic shield and the free segments of the body, except the first, is prolonged into a stout hook-like spine, and the thoracic segments have a line of short tubercles on either side of the central spine.

The caudal shield is keeled; a row of tubercles runs across it at right angles, the outermost one on each side being the largest; another row of tubercles traverses the lateral margin of the caudal shield.

Station 163A, 30 fathoms.

7. *SEROLIS PALLIDA*, n. sp.

The 'Challenger' obtained two specimens of this species, one a male and the other a female.

The female is the larger, measuring 16 millim. in length and 13 millim. in breadth, while the male is only 9 millim. long and 7 millim. broad. The body is oval, somewhat pear-shaped from the form of the caudal shield, which narrows rapidly towards the end. All the segments of the body, except the first, fifth, and sixth, are

furnished with a median, backwardly projecting spine; these spines are considerably larger in the female than they are in the male; the rest of the body is perfectly smooth and free from tubercles. The epimera are short and closely approximated, the points only of the fourth, fifth, and sixth projecting freely; the suture separating the fifth thoracic segment from the first abdominal is continuous from one side of the body to the other; the dorsal portion of the sixth segment is not represented as in the other Australian forms. The cephalic shield is almost triangular in outline from the great development of the ocular prominences and the posterior spine.

The caudal shield is hexagonal in outline, the posterior end markedly bifid; it has a longitudinal keel, and on either side, just below and to the inside of the notch which covers the articulation of the last pair of appendages, is a minute flattened tubercle. The abdominal segments have a median ventral spine, larger in the female.

The second pair of antennæ are slightly longer than the first pair; the fifth joint is remarkably large and swollen, and this feature serves to identify the species.

The lower surface of the labium and basal portion of the mandibles and maxillipedes is much sculptured.

Station 163A, 35 fathoms; and Station 162, 38-40 fathoms.

8. *SEROLIS LONGICAUDATA*, n. sp.

The aspect of this species is peculiar and very unlike the typical form of the genus. The anterior portion of the body is almost completely circular, and the caudal shield is extraordinarily long, about half as long as the rest of the body; the epimera are short and truncate at their outer ends. The segments gradually increase in breadth up to the fourth; the fifth and sixth are considerably shorter. The suture between the epimera and the tergal portion of segments two and three is situated about halfway between the articulation of the limb and the outer margin of the segment, and in the succeeding segments comes to approximate more closely to the point at which the limbs arise; hence the epimera themselves gradually increase in length from the first to the sixth as in all other species, though the circular form of the body makes it appear at first sight as if the third pair were the longest.

The single specimen contained in the 'Challenger' collection is a female; it measures 7 millim. in length and 5 millim. in greatest breadth. The surface of the body is quite smooth and free from tubercles; the sides of the thorax slope gradually downwards from the central portion, which is roof-shaped; the cephalic shield is not completely separated from the thoracic segment, the suture being incomplete posteriorly for a short space on either side of the median line; the fifth and sixth thoracic and the first abdominal segments are fused in the middle line.

The caudal shield is pentagonal in shape and longitudinally carinate; the last pair of appendages are attached about halfway down the side of the shield, and from this point a faint transverse ridge passes across at right angles to the longitudinal keel; a curved ridge follows

the lateral margin of the caudal shield on either side; the median portion of the three free abdominal segments projects freely as a long spine.

Station 161, 38 fathoms.

9. *SEROLIS MINUTA*, n. sp.

The 'Challenger' collection contains only a single example of this species; it is a male, and measures 4 millim. in length by about 4 millim. in breadth, and is therefore the smallest known species.

The dorsal portion of the fifth and sixth thoracic segments is proportionately wider than in the other Australian species, the diameter of the fifth segment being in fact hardly less than that of the fourth. The suture which separates the sixth from the succeeding segment is continued very nearly across the body; only a very small portion remains fused with and inseparable from the succeeding first abdominal segment.

The epimera of the second and third abdominal segments are well developed, and pass downwards along the caudal shield for about one third of its length; the first three epimera are closely approximated to each other, but the distal portions of the others project freely; the epimera of the two abdominal segments project further downwards than the last pair of thoracic epimera; the latter reach about as far as the lateral notch on the caudal shield, where the uropoda are attached. The first epimera show indications of division into two parts. The posterior margin of the cephalic shield is furnished with three blunt tubercles, of which the middle one is the largest; each of the succeeding segments is similarly produced into a short tubercle at the median point of the posterior margin.

The dorsal surface of all the thoracic segments except the first is prolonged on either side into a flat triangular process, which slightly overlaps the succeeding segment; these processes, which are hollow and serve for the attachment of the muscles moving the limbs, are situated on the tergal portion of the segment close to its junction with the epimeral portion.

The caudal shield is almost triangular in shape and ends in a long blunt spine; the upper surface slopes gently down on either side from the central keel. The terminal pair of appendages are attached close to the upper end of the caudal shield.

Station 161, 38 fathoms.

Geographical Distribution.—The genus *Serolis* has a limited and peculiar distribution; it is almost entirely confined to the Antarctic hemisphere. With two exceptions—*Serolis carinata*, recently described by Lockington as occurring on the shores of California, and *Serolis paradoxa*, which is said to have been obtained on the coast of Senegal—the shallow-water representatives of this genus are not found to range further north than lat. 30° S.; they inhabit the shores of all the continents and the principal groups of islands in this portion of the globe, with the exception of the Cape of Good Hope, viz. Patagonia and the Falkland Islands, the three Antarctic archipelagos (Marion Isles, the

Crozets, and Kerguelen), the shores of New Zealand (?) and some of the adjacent islands, and the southern and eastern coasts of Australia. The different species have a more or less restricted area of distribution. Seven species (*Serolis paradoxa*, *Serolis schythei*, *Serolis gaudichaudii*, *Serolis plana*, *Serolis convexa*, *Serolis serrei*, *Serolis trilobitoides*) are found in Patagonia and the Falkland Islands. Of two of these Patagonian species, *Serolis schythei* and *Serolis paradoxa*, there are specimens in the British Museum labelled "New Zealand," but I believe that this locality is not authenticated beyond a doubt. Three species, *Serolis cornuta*, *Serolis septemcarinata*, and *Serolis latifrons*, are found at Kerguelen. Of these *Serolis latifrons* has also been obtained at Possession Island, and at the Auckland Islands south of New Zealand; *Serolis cornuta* is a very close ally of *Serolis trilobitoides*, if not identical with it; *S. septemcarinata* is common to all three groups—Kerguelen, the Crozets, and Marion and Prince Edward's Islands. The six species that occur on the shores of Australia are, as has already been pointed out, distinguished by certain characters which unite them together and differentiate them from the other species of the genus.

These facts agree with what is known about the distribution of many other shallow-water animals. As a rule, there appears to be a close resemblance between the faunas of New Zealand, Kerguelen, and S. America, while the Australian species do not present such resemblances to the New-Zealand species as might perhaps be expected from the close proximity of the two regions.

The deep-sea species of *Serolis* have a wider range than the shallow-water species, although none have as yet been obtained north of the equator. *Serolis antarctica* ranges from off Pernambuco to the neighbourhood of the Crozets. Two other species, *Serolis gracilis* and *Serolis neæra*, were obtained in deep water off the coast of S. America, the former at Station 120 just below the equator, and the latter at Stations 318 and 320 further south, off Buenos Ayres. *Serolis bromleyana* was dredged at Station 156, close to the Antarctic ice-barrier, and again considerably to the north off the coast of New Zealand and between New Zealand and Australia. The comparatively wide distribution of *Serolis bromleyana* and *S. antarctica* is interesting, and agrees with what is known respecting the geographical distribution of other deep-sea animals.

The greatest depth which this genus is known to inhabit is 2040 fathoms; a single specimen of *Serolis neæra* was dredged from this depth at Station 318. *Serolis bromleyana* was dredged in 1975 fathoms at Station 186, and in 1100, 700, and 410 fathoms in the neighbourhood of New Zealand; *Serolis antarctica* ranges from 400 to 1600 fathoms. *Serolis gracilis* was only dredged at one locality, and from 675 fathoms. Gerstaecker, in his account of the Isopoda in Bronn's 'Thierreich,' points out that many species which have a wide distribution are found in deeper water as they pass southwards from the equator to the pole, and instances (from v. Willemoes Suhm's Preliminary Report on the Crustacea, etc., Proc. Roy. Soc., 1874) *Serolis bromleyana* and another species which I have named *Serolis*

antarctica. Of both these species the specimens from the more southern latitudes and deeper water are larger than those found to the north and in comparatively shallow water; especially is this so with *Serolis bromleyana*. Comparing the deep-sea species with those from shallow water, it must be noticed that in two species from the deep sea, *Serolis bromleyana* and *Serolis neæra*, the genus attains to its largest size; these two species are indeed among the largest of the whole group Isopoda. Another deep-sea Isopod described by Milne-Edwards, viz. *Bathynomus giganteus*, a genus allied to the Cymathoadæ, is also of colossal size; and the 'Challenger' collection contains a new deep-sea species which evidently belongs to the same family, and is also extremely large. All the deep-sea species of *Serolis*, with the exception of *Serolis antarctica*, have the epimera, especially those of the sixth pair, greatly elongated to an extent not found in any of the species inhabiting shallow water.

The chief differences, however, which are noticeable between the shallow-water and deep-sea representatives of the genus are to be found in the eyes.

It is well known that many deep-sea animals are entirely deprived of eyes, while in others (notably many fishes) the eyes are considerably enlarged though often pale in colour, owing to the partial absence of pigment. The presence of eyes in deep-sea animals, which would almost seem to be useless to their possessor, has been accounted for by the theory of "abyssal light," by which it is supposed that the light emanating from phosphorescent Alcyonarians is sufficient to enable these animals to see. Exact researches into the structure of eyes in the majority of deep-sea animals are wanting, and it is not certain how far optical structures are present. Up to the present the only comparison of the minute structure of the eyes in shallow-water and deep-sea representatives of the same group is, so far as I am aware, to be found in Dr. Hoek's Report on the 'Challenger' Pycnogonida. It appears from his results that the eyes in the deep-sea species are sometimes altogether absent, sometimes furnished with well-developed retinal structures; in some forms the eyes "have a distinct lens—a rounded spot marked by its brightness"; but they are quite destitute of pigment, and instead of a retina the cavity of the eyes is filled with a mass of connective tissue.

In *Serolis* the conditions are rather different; in none of the species from the deep sea is there a retinula developed, at least nothing at all similar to the retinula of the species from shallow water, but the vitreous body is represented. In *Serolis neæra* the cornea is distinctly faceted, and corresponding to each facet is an oval body which appears to represent a vitreous body; instead of being clear and transparent like the highly refractive vitreous bodies of the shallow-water *Serolis* and other Isopoda, this structure in *Serolis neæra* is granular and rather opaque in appearance, the upper half is encircled by a ring of pigment. The lower end of the "vitreous body" is imbedded in a mass of cells, which are small and closely pressed together, assuming in consequence a hexagonal contour; from the lower end of this mass of cells a stout nervous

bundle clothed with pigment-cells passes backwards. Two large nuclei of Semper are present, lying between the anterior end of the vitreous body and the cornea.

In *Serolis bromleyana* the eye has much the same structure as in *Serolis neæra*, but the cornea is not faceted and there is no pigment whatever surrounding the vitreous bodies; the eyes in this species are therefore more rudimentary.

In *Serolis gracilis* one of the specimens has eyes exactly resembling those of *Serolis bromleyana*; in another the whitish tissue of the eye only occupies a comparatively small portion of the whole ocular protuberance; the third specimen is quite blind—the ocular protuberance is present but it is quite opaque and bluish-coloured, like the surrounding integument. In this species therefore the eye appears to be just on the verge of disappearance.

The only remaining deep-sea form, *Serolis antarctica*, is entirely deprived of eyes; two minute yellowish tubercles occupy the position that the eyes ought to occupy, but there is no trace of any cornea, the integument being precisely similar to that on the rest of the body though perhaps a little thinner, and the interior of the tubercle was filled simply with a plug of connective tissue.

In the species from shallow water the eyes are invariably well developed, and show a general resemblance in structure to the eyes of other Isopoda, but at the same time present certain peculiarities: the retinula is made up of only four cells, which is an unusually small number, five or seven being most commonly met with; each of these cells is somewhat hatchet-shaped, and the anterior ends are closely applied together beneath the vitreous body; the lower portion of the retinal cell is elongated, and at about the middle is an oval thickening where the nucleus is situated. In *Serolis paradoxa* at least each retinal cell secretes a highly refractive body (phaosphere) which may be placed in front of, behind, or to one side of the nucleus. Each of the retinal cells secretes in addition a delicate chitinous rod, the rhabdomere or sehstäbchen; the four rhabdomeres are closely united to form the rhabdom, which differs in structure in different types. In *S. schythei*, *S. paradoxa*, and *S. latifrons* the rhabdom is a comparatively small conical body terminating below in a fine thread, which is prolonged backwards nearly as far as the pigmented membrane which bounds the posterior surface of the eye. In *Serolis cornuta* the rhabdom is more complicated, and has much the appearance of one of the Malpighian tufts of the kidney, from the arrangement of the chitinous rods which compose it into an irregular coil massed round a central piece; the interstices between the rods of which it is composed are filled with pigment, and the central piece is prolonged into a fine thread.

So far the eye of *Serolis* only differs in detail from that of other Isopoda, but there is another structure present, which does not appear to have been described in any other Arthropod, and certainly does not exist in any that I have examined myself. Between the retinal cells, and close to their upper extremity, are two large hyaline bodies nearly as large as the vitreous body, and presenting much the same

